Completed Project (2014 - 2015)

Propulsive Descent Technologies (PDT): Parachute Autonomous Disreef Project

Game Changing Development Program | Space Technology Mission Directorate (STMD)

ABSTRACT

Parachute reefing is a method to control a parachute's drag area by constricting the parachute diameter with a textile cord. Mechanically-actuated, time delay fused, pyrotechnic devices are the common method used to cut the textile cord allowing the parachute diameter to expand; thus, increasing drag. Time delay error band yields imprecise control of parachute drag area which can cause lead-lag problems in parachute cluster systems yielding an overdesigned system resulting in mass and volume penalties. The use of electrically-actuated cord cutters receiving fire commands via a transceiver provides solutions to those known inconsistencies of disreefing singular and parachute clusters by providing precise control. This technology has future applications to abort modes in particular, where the vehicle state has a profound influence on the loads imparted when the parachute disreefs.

ANTICIPATED BENEFITS

To NASA funded missions:

An Autonomous Parachute Disreef System improves reliability by allowing parachute drag to be modulated based on flight conditions and not constrained to traditional aprior determined time delay values for mechanical actuated pyrotechnic reefing line cutters. Mass savings are also realized, since the parachute architecture does not need to be designed for a "one size fits all" recovery system over the entire deployment envelope.

DETAILED DESCRIPTION

Pioneer Aerospace holds a patent to an existing parachute wireless disreef device (patent number US20070252042, http://www.google.com/patents/US20070252042). The wireless device weighs approximately 8 oz. and is 6.5" in length. A single helicopter drop test will be performed to demonstrate the

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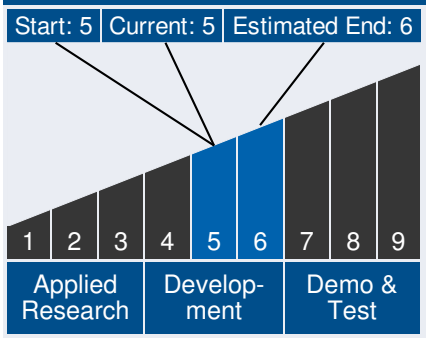
Technology Maturity



Management Team

Program Executive:

- Ryan Stephan

Program Manager:

- Stephen Gaddis

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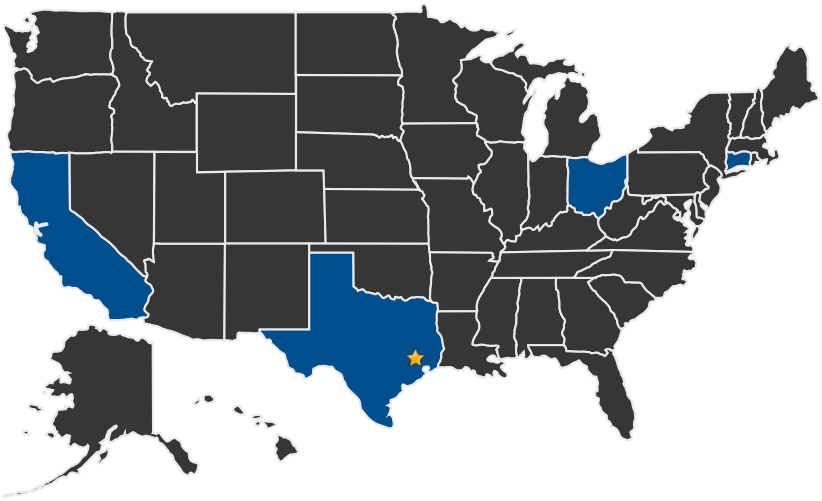
functionality of the system in a configuration comparable to an anticipated demonstration on an Orion drop test utilizing the Orion test article platform recovery system. The demonstration test configuration will approximate the Orion main parachute trailing distance of ~250' to demonstrate wireless communication functionality. The payload weight will be such that the rate of descent is similar to the Orion test article platform. The demonstration parachute will have two reefing stages as the Orion parachutes have two reefing stages. The demonstration parachute is much smaller than the Orion main parachute, 29' diameter as compared to 116' diameter, respectively. Confirmation of system operation will be via onboard upward looking video, Ground-to-Air Video, and the wireless devices' onboard health and status data acquisition.

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Johnson Space Center

Management Team *(cont.)*

Project Manager:
- Charles Campbell

Principal Investigator:
- Michelle Munk

Technology Areas

Primary Technology Area:
Entry, Descent, and Landing Systems (TA 9)
- Descent and Targeting (TA 9.2)
  - Trailing Deployable Decelerators (TA 9.2.2)
    - Autonomous Parachute Disreef (TA 9.2.2.3)

Other Organizations Performing Work:

- ALD Systems
- Naval Air Warfare Center
- Pioneer Aerospace Corporation

DETAILS FOR TECHNOLOGY 1

Technology Title

Autonomous Parachute Disreef System

Technology Description

This technology is categorized as a hardware assembly for unmanned flight

Wireless communication from a payload mounted transceiver to an electrically initiated reefing line cutter activated by commands to a transceiver installed on a parachute or parachute cluster.

Capabilities Provided

- Time
- Altitude
- Acceleration

Potential Applications

- Manned Space Flight
- Unmanned Space Flight
- Atmospheric Crew Escape Systems
- Cargo Air Delivery Systems